

REMARKS

Claims 1-19 are rejected under 35 U.S.C. 103(a) as being obvious over Hasberg et al. (U.S. Patent No. 6,753,134). The Examiner notes that Hasberg et al. discloses a process for the preparation of a radiation-sensitive silver halide emulsion comprised of high bromide cubical silver halide grains, the process comprising: (a) providing in a stirred reaction vessel a dispersing medium and high bromide silver halide seed grains, the seed grains comprising at least 5 mole % of the final emulsion silver, and (b) precipitating a silver halide shell which comprises at least 5 mole % of the final emulsion silver onto the seed grains to form high bromide cubical silver halide grains by introducing at least a silver salt solution into the dispersing medium at a rate such that the normalized shell molar addition rate, R_s , is above $1.0 \times 10^{-3} \text{ min}^{-2}$, wherein the concentration of silver halide grains in the reaction vessel at the end of the precipitation of the shell is at least 0.5 mole/L. While stating that the temperature utilized in the reaction vessel of the process disclosed in Hasberg et al. is 40°C (see Examples therein), whereas the temperature in present invention is “at least 65°C” (claim 1, line 7), the Examiner states that it would have been obvious to one of ordinary skill in the requisite art at the time the invention was made to vary the temperature of the reaction vessel to optimize the benefits of the inventive process. Reconsideration of this rejection is respectfully traversed.

Contrary to the Examiner's assertions, the difference between the disclosure of Hasburg et al. '134 and the instant claimed invention is not that the temperature utilized in the reaction vessel of the process disclosed in Hasberg et al. is 40°C. Example 1 of Hasberg et al. rather employs a reaction temperature of approximately 65C (col. 12, lines 32-33), while Example 2 employs a reaction temperature of approximately 67C (col. 13, lines 34-35). Rather, the difference is that the present invention is directed towards solving a problem which has been found to occur at temperatures of at least 65C when R_s is above $1.0 \times 10^{-3} \text{ min}^{-2}$, as suggested by Hasberg et al. '134, and if the surface area normalized instantaneous molar addition rate, R_i , during at least a portion of the shell growth is above $(24T - 1380) \text{ mol/min/m}^2$ when the contents of the reaction vessel are maintained at a temperature of from 65°C to 70°C, or is above 300 mol/min/m^2 when the contents of the vessel are maintained at a temperature above 70°C, where T represents the temperature of the contents of the vessel in °C, and R_i satisfies the formula:

$$R_i = \frac{Q_f C_f}{n S_c}$$

where Q_f is the volumetric rate of addition, in liters/min, of silver salt solution to the reaction vessel, C_f is the concentration, in moles/liter, of the silver salt solution, S_c is the average surface area of an individual grain core already formed in the vessel, and n is the total number of grain cores in the vessel.

As discussed at page 12, lines 12+ of the specification, the minimum R_i values set forth define a region wherein it has been found that, absent countervailing measures, silver bromide fine grains will not completely effectively ripen during shell growth in a high normalized shell molar addition rate process. The experimentally determined critical ripening rate as a function of temperature for silver bromide emulsions is represented in Figure 1, which indicates whether a second stable grain population is obtained for various silver bromide emulsions prepared under high normalized shell molar addition rate processes at various temperatures (details of the experimental emulsion make processes are provided in the Examples). While an essentially monomodal distribution of grain size is obtained for silver bromide emulsions prepared at a temperature of 65°C and an R_i rate of 180 mol/min/m², as well as for silver bromide emulsions prepared at a temperature of 70°C and an R_i rate of 300 mol/min/m², bimodal distributions of grain sizes are obtained for otherwise essentially equivalent emulsions prepared at higher R_i rates at such temperatures. At a temperature of 75°C, a bimodal distribution is obtained at a similar R_i rate as found to result in a bimodal distribution at 70°C. Fig. 1 thus illustrates that, absent countervailing measures, at R_i rates above (24T – 1380) mol/min/m² for temperatures T of from 65°C to 70°C, and above 300 mol/min/m² for temperatures above 70°C, the fine silver bromide grains formed in a high normalized shell molar addition rate process may be stable, and the resulting high bromide silver halide emulsion may have a bimodal particle size distribution. Since 75°C is generally considered to be a practical upper limit for temperature in the precipitation of silver halide emulsions, Fig. 1 illustrates that, absent countervailing measures, R_i rates above approximately 350 mol/min/m² appear likely to result in high bromide silver halide emulsions which will have a bimodal particle size distribution at all temperatures from 65-75°C.

In accordance with the present invention, to address such specific problem occurring at high temperatures and high surface area normalized instantaneous molar addition rates, a minor percentage of chloride ions, relative to bromide, is introduced into the reaction vessel prior to or concurrent with precipitation of the high bromide shell. The presence of a minor percentage of chloride ions in the reaction vessel during high bromide shell growth in accordance with the invention allows for R_i surface area normalized instantaneous molar addition rates higher than the above described minimums to be practiced, while still avoiding the formation of a secondary stable grain population which may otherwise occur in the absence of any chloride ion at such high R_i rates. Thus, the present invention is not a mere variation of the temperature of the reaction vessel of Hasberg et al. '134 to optimize the benefits of the inventive process as proposed by the Examiner, but rather is directed towards the identification of a problem at a certain temperature range, and a specific solution to such problem. As the specific combination of R_s , R_i , temperature, and chloride ion requirements set forth in the present claims is not taught by Hasberg et al. '134, the present claims are believed to be patentable thereover. Reconsideration of this rejection is accordingly respectfully requested.

In view of the foregoing remarks, reconsideration of this patent application is respectfully requested. A prompt and favorable action by the Examiner is earnestly solicited. Should the Examiner believe any remaining issues may be resolved via a telephone interview, the Examiner is encouraged to contact Applicants' representative at the number below to discuss such issues.

Respectfully submitted,



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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.